

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
United States Patent and Trademark
Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 26 July 2000 (26.07.00)	
International application No. PCT/SE99/02218	Applicant's or agent's file reference PCT 51230 cg
International filing date (day/month/year) 29 November 1999 (29.11.99)	Priority date (day/month/year) 14 December 1998 (14.12.98)
Applicant LETH, Siv et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

05 June 2000 (05.06.00)

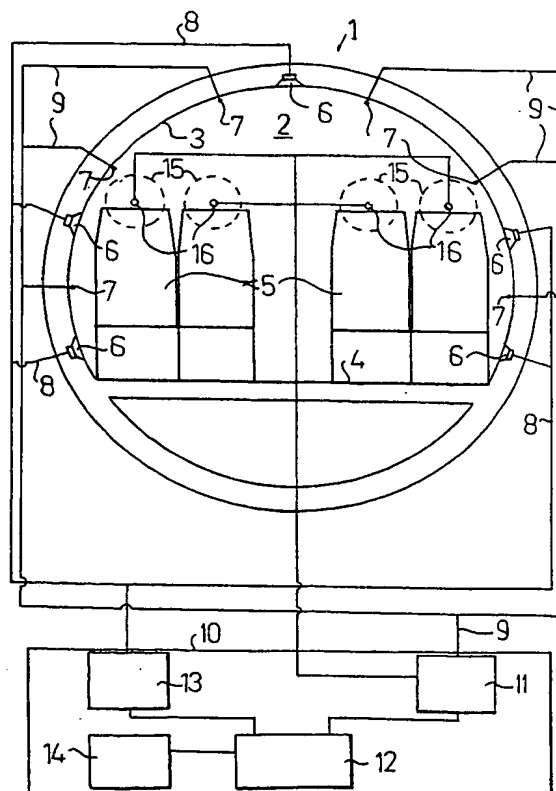
☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Manu Berrod
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : G10K 11/178	A1	(11) International Publication Number: WO 00/36590 (43) International Publication Date: 22 June 2000 (22.06.00)
(21) International Application Number: PCT/SE99/02218 (22) International Filing Date: 29 November 1999 (29.11.99) (30) Priority Data: 9804311-0 14 December 1998 (14.12.98) SE (71) Applicant (for all designated States except US): SAAB AB [SE/SE]; S-581 88 Linköping (SE). (72) Inventors; and (75) Inventors/Applicants (for US only): LETH, Siv [SE/SE]; Simesgården, S-760 41 Arholma (SE). HALVORSEN, William, G. [US/US]; 1311 Dillon Avenue, Cincinnati, OH 45208 (US). BARNEY, Patrick [US/US]; 973 Antelope N.E., Albuquerque, NM 87122 (US). (74) Agents: BERGLUND, Stefan et al.; Bjerkéns Patentbyrå KB, Östermalmsgatan 58, S-114 50 Stockholm (SE).		(81) Designated States: AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
(54) Title: A METHOD OF AND A DEVICE FOR ACTIVELY REDUCING THE LEVEL OF A PRIMARY FIELD OF SOUND OR VIBRATION IN A SPACE		
(57) Abstract The invention concerns a method and a device for actively reducing the level of a primary field of sound or vibration in a space (2). Control sensors (7) sense a parameter related to said level. Actuators (6) produce a secondary field of sound or vibration interfering with said primary field. A first transfer function matrix defines for each control sensor the level of the parameter caused by the actuator excitation. Monitor sensors (16) sense said parameter related to the level of the primary field. A second transfer matrix defines for each monitor sensor (16) the level caused by actuator excitation. A control unit (10) controls the actuators (6) by the relation between the first transfer matrix and the second transfer matrix, the control sensors (7) and the monitor sensors (16), and a residual vector of the actual level of the control sensors.		



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

Claims

1. A method of actively reducing the level of a primary field of sound or vibrations in a space (2), comprising the steps of:

providing a first number of actuators (6) in the space (2) to produce a secondary field of sound or vibration, which is adapted to interfere with the primary field;

providing a second number of control sensors (7) in the space (2) to sense a parameter related to the residual level of the primary field and the secondary field; and

determining a first transfer matrix (c) defining for each control sensor (7) the level of the parameter caused by a certain level of excitation from each actuator (6),

characterized by

providing, during an initial, provisional period of time, a third number of monitor sensors (16) in the space (2) to sense the parameter related to the level of the primary field;

determining a second transfer matrix (g) defining for each monitor sensor (16) the level of the parameter caused by a certain level from each actuator (6); and

controlling the actuators (6) by means of a force vector (F) being a function (n) of the first transfer matrix (c), a

first projection matrix (j) reflecting the relation between the first transfer matrix (c) and said second transfer matrix (g), a second projection matrix (k) reflecting the relations between the parameter sensed by the control sensors (7) and the parameter sensed by said monitor sensors (16), and a residual vector (b) of the actual level of the parameter at the control sensors (7).

2. A method according to claim 1, characterized by providing said monitor sensors (16) at respective positions (15) at which a significant reduction of the level of the primary field is desired.

3. A method according to claim 2, characterized by providing the control sensors (7) at locations removed from the positions (15) of said monitor sensors (16).

5

4. A method according to any one of the preceding claims, characterized by producing said force vector (F) by the multiplication of the pseudo inverse of the first transfer matrix (e), said first projection matrix (j), the pseudo inverse of the said second projection matrix (o), and said residual vector (b).

10

5. A method according to any one of the preceding claims, characterized by reducing the number of control sensors (7) included in the first projection matrix (j) and the second projection matrix (o) to include only an optimal set of control sensors (7) for projecting each monitor sensor (16).

15

6. A method according any one of the preceding claims, characterized in that the parameter comprises a pressure.

20

7. A method according to any one of the preceding claims, characterized in that the parameter comprises a vibration.

8. A device for actively reducing the level of a primary field of sound or vibration in a space (2), comprising a first number of control sensors (7) provided in the space (2) to sense a parameter related to the residual level of the primary field and the secondary field;

25

a second number of actuators (6) provided in the space (2) to produce a secondary field of sound or vibrations, which is adapted to interfere with the primary field;

30

a first determining means provided to determine a first transfer function matrix (c) defining for each control sensor (7) the level of the parameter caused by a certain level of the excitation from each actuator (6),

35

characterized by

a third number of monitor sensors (16) arranged to be provided in said space (2) during an initial, provisional period of time to sense the parameter related to the level of the primary field;

a second determining means provided to determine a second transfer matrix (g) defining for each monitor sensor (16) the level of the parameter caused by a certain level from each actuator (6); and

a control unit provided to control the actuators (6) by means of a force vector (F) being a function (n) of the first transfer matrix (c), a first projection matrix (j) reflecting the relation between the first transfer matrix (c) and said second transfer matrix (g), a second projection matrix (k) reflecting the relations between the parameter sensed by the control sensors (7) and the parameter sensed by said monitor sensors (16), and a residual vector (b) of the actual level of the parameter at the control sensors (7).

9. A device according to claim 8, characterized in that said monitor sensors (16) are provided to be arranged during a preparing period of time at respective positions (15) at which a significant reduction of the level of the primary field is desired.

10. A device according to claim 9, characterized in that the control sensors (7) are provided at positions removed from the positions (15) of said monitor sensors (16).

11. A device according to any one claims 8 to 10, characterized in that said control unit (10, 12) is arranged to produce said force vector (F) by the multiplication of the pseudo inverse of the first transfer matrix (e), said first projection matrix (j), the pseudo inverse of the said second projection matrix (o), and said residual vector (b).

12. A device according to any one of claims 8 to 11,
characterized in that said control unit (10, 12) is arranged
to reduce the number of control sensors (7) included in the
5 first projection matrix (j) and the second projection matrix
(o) to include only an optimal set of control sensors (7)
for projecting each monitor sensor (16).

The demand must be filed directly with the competent International Preliminary Examining Authority, if two or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of that Authority must be indicated by the applicant on the line below:

IPEA/ SE

PCT

CHAPTER II

DEMAND

under Article 31 of the Patent Cooperation Treaty:
The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only

Identification of IPEA		Date of receipt of DEMAND
Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION		Applicant's or agent's file reference PCT 51230 sb/cg
International application No. PCT/SE99/02218	International filing date (day/month/year) 29/11/1999	(Earliest) Priority date (day/month/year) 14/12/1998
Title of invention "A method of and a device for actively reducing the sound level in a region of a space"		
Box No. II APPLICANT(S)		
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) SAAB AB SE-581 88 Linköping SWEDEN		Telephone No.: Facsimile No.: Teleprinter No.:
State (that is, country) of nationality: Sweden	State (that is, country) of residence: Sweden	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) LETH, Siv Simesgården SE-760 41 Arholma SWEDEN		
State (that is, country) of nationality: Sweden	State (that is, country) of residence: Sweden	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) HALVORSEN, William G. 1311 Dillon Avenue Cincinnati OH 45208 USA		
State (that is, country) of nationality: USA	State (that is, country) of residence: USA	
<input checked="" type="checkbox"/> Further applicants are indicated on a continuation sheet.		

Continuation of Box No. II APPLICANT(S)

*If none of the following sub-boxes is used, this sheet should not be included in the demand.*Name and address: *(Familyname followed by givenname: for a legal entity, full official designation. The address must include postal code and name of country.)*

BARNEY, Patrick
973 Antelope NE
Albuquerque
NM 87122
USA

State *(that is, country)* of nationality:

USA

State *(that is, country)* of residence:

USA

Name and address: *(Familyname followed by givenname: for a legal entity, full official designation. The address must include postal code and name of country.)*State *(that is, country)* of nationality:State *(that is, country)* of residence:Name and address: *(Familyname followed by givenname: for a legal entity, full official designation. The address must include postal code and name of country.)*State *(that is, country)* of nationality:State *(that is, country)* of residence:Name and address: *(Familyname followed by givenname: for a legal entity, full official designation. The address must include postal code and name of country.)*State *(that is, country)* of nationality:State *(that is, country)* of residence:☐

Further applicants are indicated on another continuation sheet.

Box No. III AGENT OR COMMON REPRESENTATIVE: OR ADDRESS FOR CORRESPONDENCEThe following person is ☒ agent ☐ common representativeand ☒ has been appointed earlier and represents the applicant(s) also for international preliminary examination.☐ is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.☐ is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*BJERKÉNS PATENTBYRÅ KB, represented by
BERGLUND, Stefan; BJERKÉN, Håkan;
OLSSON, Jan or ISRAELSSON, StefanÖstermalmsgatan 58
SE-114 50 Stockholm
SWEDEN

Telephone No.:

08-662 08 70

Facsimile No.:

08-663 02 60

Teleprinter No.:

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.**Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION****Statement concerning amendments:***

1. The applicant wishes the international preliminary examination to start on the basis of:

☒ the international application as originally filedthe description ☐ as originally filed
☐ as amended under Article 34the claims ☐ as originally filed
☐ as amended under Article 19 (together with any accompanying statement)
☐ as amended under Article 34the drawings ☐ as originally filed
☐ as amended under Article 342. ☐ The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.3. ☐ The applicant wishes the start of the international preliminary examination to be postponed until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination: English☒ which is the language in which the international application was filed.☐ which is the language of a translation furnished for the purposes of international search.☒ which is the language of publication of the international application.☐ which is the language of the translation (to be) furnished for the purposes of international preliminary examination.**Box No. V ELECTION OF STATES**The applicant hereby elects all eligible States *(that is, all States which have been designated and which are bound by Chapter II of the PCT)*

excluding the following States which the applicant wishes not to elect:

Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:

- | | | |
|--|---|--------|
| 1. translation of international application | : | sheets |
| 2. amendments under Article 34 | : | sheets |
| 3. copy (or, where required, translation) of amendments under Article 19 | : | sheets |
| 4. copy (or, where required, translation) of statement under Article 19 | : | sheets |
| 5. letter | : | sheets |
| 6. other (<i>specify</i>) | : | sheets |

For International Preliminary
Examining Authority use only

received not received

<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

The demand is also accompanied by the item(s) marked below:

- | | |
|--|---|
| 1. <input checked="" type="checkbox"/> fee calculation sheet | 4. <input type="checkbox"/> statement explaining lack of signature |
| 2. <input type="checkbox"/> separate signed power of attorney | 5. <input type="checkbox"/> nucleotide and or amino acid sequence listing in computer readable form |
| 3. <input type="checkbox"/> copy of general power of attorney; reference number, if any: | 6. <input type="checkbox"/> other (<i>specify</i>): |

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the persons signing and the capacity in which the persons signs (if such capacity is not obvious from reading the demand).

Stockholm, 5 June, 2000

BJERKENS PATENTBYRÅ KB

Stefan Berglund

For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:

2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):

3. ☐ The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5. below, does not apply.

☐ The applicant has been informed accordingly.

4. ☐ The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.

5. ☐ Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82.

For International Bureau use only

Demand received from IPEA on:

PCT

FEE CALCULATION SHEET

Annex to the Demand for international preliminary examination

International application No. PCT/SE99/02218	For International Preliminary Examining Authority use only	
Applicant's or agent's file reference PCT 51230 sb/cg	Date stamp of the IPEA	
Applicant SAAB AB et al		
Calculation of prescribed fees		
1. Preliminary examination fee	4 200: -	<input type="checkbox"/> P
2. Handling fee <i>(Applicants from certain States are entitled to a reduction of 75% of the handling fee. Where the applicant is (or all applicants are) so entitled, the amount to be entered at H is 25% of the handling fee.)</i>	1 270: -	<input type="checkbox"/> H
3. Total of prescribed fees Add the amounts entered at P and H and enter total in the TOTAL box	5 470: -	
TOTAL		
Mode of Payment		
<input type="checkbox"/> authorization to charge deposit account with the IPEA (see below)	<input type="checkbox"/> cash	
<input checked="" type="checkbox"/> cheque	<input type="checkbox"/> revenue stamps	
<input type="checkbox"/> postal money order	<input type="checkbox"/> coupons	
<input type="checkbox"/> bank draft	<input type="checkbox"/> other (specify):	
Deposit Account Authorization <i>(this mode of payment may not be available at all IPEAs)</i>		
The IPEA/ _____ <input type="checkbox"/> is hereby authorized to charge the total fees indicated above to my deposit account.		
<input type="checkbox"/> <i>(this check-box may be marked only if the conditions for deposit accounts of the IPEA so permit)</i> is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.		
Deposit Account Number _____	Date (day/month/year) _____	Signature _____

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

097857974

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum)

PCT 51230 cg

Box No. I TITLE OF INVENTION

"A method of and a device for actively reducing the sound level in a region of a space"

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

SAAB AB
SE-581 88 Linköping
SWEDEN

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State (that is, country) of nationality:

Sweden

State (that is, country) of residence:

Sweden

This person is applicant for the purposes of:

☐ all designated States

☒ all designated States except the United States of America

☐ the United States of America only

☐ the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

LETH, Siv
Simesgården
SE-760 41 Arholma
SWEDEN

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

Sweden

State (that is, country) of residence:

Sweden

This person is applicant for the purposes of:

☐ all designated States

☐ all designated States except the United States of America

☒ the United States of America only

☐ the States indicated in the Supplemental Box

☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:

☒ agent

☐ common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

BJERKENS PATENTBYRÅ KB, represented by
BERGLUND, Stefan; ISRAELSSON, Stefan;
BJERKÉN, Håkan; FRÖDERBERG, Oskar; or
OLSSON, Jan;
Östermalmsgatan 58
SE-114 50 Stockholm, SWEDEN

Telephone No.

08 - 662 08 70

Facsimile No.

08 - 663 02 60

Teleprinter No.

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

If none of the following sub-boxes is used, this sheet should not be included in the request.

Name and address: (Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

HALVORSEN, William G.
1311 Dillon Avenue
Cincinnati
OH 45208
USA

This person is:

- ☐ applicant only
☒ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

USA

State (that is, country) of residence:

USA

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

BARNEY, Patrick
973 Antelope NE
Albuquerque
NM 87122
USA

This person is:

- ☐ applicant only
☒ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

USA

State (that is, country) of residence:

USA

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
☐ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
☐ applicant and inventor
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on another continuation sheet.

Box No. V DESIGNATION STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes: at least one must be marked):

Regional Patent

- ☒ AP ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SZ Swaziland, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ EA Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ EP European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ OA OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- | | |
|--|--|
| <input checked="" type="checkbox"/> AL Albania | <input checked="" type="checkbox"/> LS Lesotho |
| <input checked="" type="checkbox"/> AM Armenia | <input checked="" type="checkbox"/> LT Lithuania |
| <input checked="" type="checkbox"/> AT Austria and utility model | <input checked="" type="checkbox"/> LU Luxembourg |
| <input checked="" type="checkbox"/> AU Australia | <input checked="" type="checkbox"/> LV Latvia |
| <input checked="" type="checkbox"/> AZ Azerbaijan | <input checked="" type="checkbox"/> MD Republic of Moldova |
| <input checked="" type="checkbox"/> BA Bosnia and Herzegovina | <input checked="" type="checkbox"/> MG Madagascar |
| <input checked="" type="checkbox"/> BB Barbados | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> BG Bulgaria | <input checked="" type="checkbox"/> MN Mongolia |
| <input checked="" type="checkbox"/> BR Brazil | <input checked="" type="checkbox"/> MW Malawi |
| <input checked="" type="checkbox"/> BY Belarus | <input checked="" type="checkbox"/> MX Mexico |
| <input checked="" type="checkbox"/> CA Canada | <input checked="" type="checkbox"/> NO Norway |
| <input checked="" type="checkbox"/> CH and LI Switzerland and Liechtenstein | <input checked="" type="checkbox"/> NZ New Zealand |
| <input checked="" type="checkbox"/> CN China | <input checked="" type="checkbox"/> PL Poland |
| <input checked="" type="checkbox"/> CU Cuba | <input checked="" type="checkbox"/> PT Portugal |
| <input checked="" type="checkbox"/> CZ Czech Republic and utility model | <input checked="" type="checkbox"/> RO Romania |
| <input checked="" type="checkbox"/> DE Germany and utility model | <input checked="" type="checkbox"/> RU Russian Federation |
| <input checked="" type="checkbox"/> DK Denmark and utility model | <input checked="" type="checkbox"/> SD Sudan |
| <input checked="" type="checkbox"/> EE Estonia and utility model | <input checked="" type="checkbox"/> SE Sweden |
| <input checked="" type="checkbox"/> ES Spain | <input checked="" type="checkbox"/> SG Singapore |
| <input checked="" type="checkbox"/> FI Finland and utility model | <input checked="" type="checkbox"/> SI Slovenia |
| <input checked="" type="checkbox"/> GB United Kingdom | <input checked="" type="checkbox"/> SK Slovakia and utility model |
| <input checked="" type="checkbox"/> GE Georgia | <input checked="" type="checkbox"/> SL Sierra Leone |
| <input checked="" type="checkbox"/> GH Ghana | <input checked="" type="checkbox"/> TJ Tajikistan |
| <input checked="" type="checkbox"/> GM Gambia | <input checked="" type="checkbox"/> TM Turkmenistan |
| <input checked="" type="checkbox"/> GW Guinea-Bissau | <input checked="" type="checkbox"/> TR Turkey |
| <input checked="" type="checkbox"/> HR Croatia | <input checked="" type="checkbox"/> TT Trinidad and Tobago |
| <input checked="" type="checkbox"/> HU Hungary | <input checked="" type="checkbox"/> UA Ukraine |
| <input checked="" type="checkbox"/> ID Indonesia | <input checked="" type="checkbox"/> UG Uganda |
| <input checked="" type="checkbox"/> IL Israel | <input checked="" type="checkbox"/> US United States of America |
| <input checked="" type="checkbox"/> IS Iceland | <input checked="" type="checkbox"/> UZ Uzbekistan |
| <input checked="" type="checkbox"/> JP Japan | <input checked="" type="checkbox"/> VN Viet Nam |
| <input checked="" type="checkbox"/> KE Kenya | <input checked="" type="checkbox"/> YU Yugoslavia |
| <input checked="" type="checkbox"/> KG Kyrgyzstan | <input checked="" type="checkbox"/> ZW Zimbabwe |
| <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea | |
| <input checked="" type="checkbox"/> KR Republic of Korea | |
| <input checked="" type="checkbox"/> KZ Kazakhstan | |
| <input checked="" type="checkbox"/> LC Saint Lucia | |
| <input checked="" type="checkbox"/> LK Sri Lanka | |
| <input checked="" type="checkbox"/> LR Liberia | |

Check-boxes reserved for designating States (for the purposes of a national patent) which have become party to the PCT after issuance of this sheet:

- ☐
- ☐

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)

Box No. VI PRIORITY CLAIM		<input type="checkbox"/> Further priority claim indicated in the Supplemental Box.		
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application:* regional Office	international application: receiving Office
item (1) 14/12/1998	9804311-0	Sweden		
item (2)				
item (3)				

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s): (1)

* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):	Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):		
ISA / SE	Date (day/month/year)	Number	Country (or regional Office)
	24/09/1999	SE98/01417	Sweden

Box No. VIII CHECK LIST: LANGUAGE OF FILING

This international application contains the following number of sheets:	This international application is accompanied by the item(s) marked below:
request : 4	1. <input checked="" type="checkbox"/> fee calculation sheet
description (excluding sequence listing part) : 11	2. <input type="checkbox"/> separate signed power of attorney
claims : 4	3. <input type="checkbox"/> copy of general power of attorney; reference number, if any:
abstract : 1	4. <input type="checkbox"/> statement explaining lack of signature
drawings : 1	5. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s):
sequence listing part of description : _____	6. <input type="checkbox"/> translation of international application into (language):
Total number of sheets : 21	7. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material
	8. <input type="checkbox"/> nucleotide and/or amino acid sequence listing in computer readable form
	9. <input checked="" type="checkbox"/> other (specify): ITS-report

Figure of the drawings which should accompany the abstract: Fig 1	Language of filing of the international application: English
---	--

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

Stockholm, 24 November 1999

BJERKÉNS PATENTBYRÅ KB

Stefan Berglund

For receiving Office use only		2. Drawings: <input type="checkbox"/> received: <input type="checkbox"/> not received:
1. Date of actual receipt of the purported international application:		
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:		
4. Date of timely receipt of the required corrections under PCT Article 11(2):		
5. International Searching Authority (if two or more are competent): ISA /	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid.	

For International Bureau use only
Date of receipt of the record copy by the International Bureau:

PCT

FEE CALCULATION SHEET Annex to the Request

For receiving Office use only

International application No.

Date stamp of the receiving Office

Applicant's or agent's
file reference

PCT 51230 sb/cg

Applicant

SAAB AB et al

CALCULATION OF PRESCRIBED FEES

1. TRANSMITTAL FEE 1 000:- T

2. SEARCH FEE 8 510:- S

International search to be carried out by

(If two or more International Searching Authorities are competent in relation to the international application, indicate the name of the Authority which is chosen to carry out the international search.)

3. INTERNATIONAL FEE

Basic Fee

The international application contains 21 sheets.

first 30 sheets 3 500:- b1

remaining sheets x additional amount = b2

Add amounts entered at b1 and b2 and enter total at B 3 500:- B

Designation Fees

The international application contains 10 designations.

10 x 800:- = 8 000:- D

number of designation fees payable (maximum 10) amount of designation fee

Add amounts entered at B and D and enter total at I 11 500:- I

(Applicants from certain States are entitled to a reduction of 75% of the international fee. Where the applicant is (or all applicants are) so entitled, the total to be entered at I is 25% of the sum of the amounts entered at B and D.)

4. FEE FOR PRIORITY DOCUMENT (if applicable) P

5. TOTAL FEES PAYABLE 21 010:-

Add amounts entered at T, S, I and P, and enter total in the TOTAL box

TOTAL

☐ The designation fees are not paid at this time.

MODE OF PAYMENT

☐ authorization to charge
deposit account (see below)

☐ bank draft

☐ coupons

☒ cheque

☐ cash

☐ other (specify):

☐ postal money order

☐ revenue stamps

DEPOSIT ACCOUNT AUTHORIZATION (this mode of payment may not be available at all receiving Offices)

The RO/ ☐ is hereby authorized to charge the total fees indicated above to my deposit account.

☐ (this check-box may be marked only if the conditions for deposit accounts of the receiving Office so permit) is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.

☐ is hereby authorized to charge the fee for preparation and transmittal of the priority document to the International Bureau of WIPO to my deposit account.

Deposit Account No.

Date (day/month/year)

Signature

REC'D 09 APR 2001

WIPO

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference PCT 51230 sb/cg	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/SE99/02218	International filing date (day/month/year) 29.11.1999	Priority date (day/month/year) 14.12.1998
International Patent Classification (IPC) or national classification and IPC7 G10K 11/178		
Applicant Saab Aktiebolag et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
- ☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).
- These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 05.06.2000	Date of completion of this report 28.03.2001
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88	Authorized officer Leif Vingård / JA A Telephone No. 08-782 25 00

Form PCT/IPEA/409 (cover sheet) (January 1998)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/SE99/02218

I. Basis of the report

1. With regard to the **elements** of the international application:*

- ☐ the international application as originally filed
- ☒ the description:
pages 1-11 , as originally filed
pages _____ , filed with the demand
pages _____ , filed with the letter of _____
- ☒ the claims:
pages _____ , as originally filed
pages _____ , as amended (together with any statement) under article 19
pages _____ , filed with the demand
pages 12-15 , filed with the letter of 20.02.2001
- ☒ the drawings:
pages 1 , as originally filed
pages _____ , filed with the demand
pages _____ , filed with the letter of _____
- ☐ the sequence listing part of the description:
pages _____ , as originally filed
pages _____ , filed with the demand
pages _____ , filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item. These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheet/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2.(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/SE99/02218

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>1-12</u>	YES
	Claims	_____	NO
Inventive step (IS)	Claims	<u>1-12</u>	YES
	Claims	_____	NO
Industrial applicability (IA)	Claims	<u>1-12</u>	YES
	Claims	_____	NO

2. Citations and explanations (Rule 70.7)

Cited documents:

- D1) EP 0568282 A2 (WESTINGHOUSE ELECTRIC CORPORATION)
- D2) WO 9806089 A1 (LORD CORPORATION)
- D3) US 5245552 A (A. O. ANDERSSON ET AL)
- D4) US 5426703 A (T. HAMABE ET AL)

Explanation:

The invention refers to a method and a device for actively reducing the level of a primary field of sound or vibration in a space. Said method and device comprise control sensors which sense a parameter related to said level. A first number of actuators produce a secondary field of sound or vibration that interferes with said primary field. A first transfer function matrix defines for each control sensor the level of the parameter caused by the actuator excitation. Monitor sensors sense said parameter related to the level of the primary field. A second transfer matrix defines for each monitor sensor the level caused by actuator excitation. A control unit controls the actuators by the relation between the first transfer matrix and the second transfer matrix, the control sensors and the monitor sensors, and a residual vector of the actual level of the control sensors.

It is previously known in the art to reduce a level of a primary field of noise in a space by means of actuators providing a secondary field of sound that interferes with the primary field. According to said prior art, a set of control sensors is provided in the space at the locations where maximum reduction of noise level is desired. A control unit provides such a force at each actuator that the sound level at the control sensors is reduced to a minimum level.

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: V.

However, the noise level may be significant at positions at a distance from the control sensors. Thus, at certain locations the secondary field may interfere in such a way that the total level of the combined fields is higher than the level of the primary field alone. Consequently, it is necessary to position the control sensors immediately adjacent to the locations where maximum reduction of noise level is desired, which is not always possible.

The object of the present invention is to provide an arrangement that can reduce noise and/or vibration levels at an arbitrary position in a space. Said object is obtained by providing, during an initial, provisional period of time, a third number of monitor sensors in the space to sense the parameter related to the level of the primary field, determining a second transfer matrix defining for each monitor sensor the level of the parameter caused by a certain level from each actuator, and controlling the actuators by means of a force vector being a function of the first transfer matrix, a first projection matrix reflecting the relation between the first transfer matrix and said second transfer matrix, a second projection matrix reflecting the relations between the parameter sensed by the control sensors and the parameter sensed by said monitor sensors, and a residual vector of the actual level of the parameter at the control sensors.

By such a method, it is possible to provide an arbitrary number of actuators, control sensors and monitor sensors, and thereby take into account the complexity of the fields in such a manner that a significant reduction of the noise or vibration level is obtained in the space at the location of the monitor sensors. The location may be in a position where it is not practically possible to provide control sensors, e.g., at the location of a passenger in an aircraft cabin. According to the invention, the control sensors are projected to the monitor sensors.

The method and the device according to the invention involve novelty and progress with respect to prior art as indicated from D1-D4. Furthermore, as said method and device are not obvious or close at hand to a person ordinarily skilled in the art, they involve inventive step. Their industrial applicability is obvious.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/SE99/02218

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Claims 4, 5, 6 and 11 are not drafted in accordance with PCT Rule 6.4(a), 3rd sentence.

The word "removed" on line 12, p. 2 in the description should preferably be replaced by the phrase "at a distance".